

Patent claims

1. A continuous process for producing polyamides, their oligomers or mixtures thereof, if appropriate with further reaction products, by reaction of aminonitriles or dinitriles and diamines or mixtures thereof, if appropriate together with further polyamide-forming monomers and/or oligomers, with an aqueous medium composed of aqueous monomer and oligomer extracts obtained from polyamide production by extraction of the polymer with water, in a reactor which has a vertical longitudinal axis and through which there is a flow substantially in the longitudinal direction, wherein water and/or the aqueous medium are introduced into the reactor at two or more different locations along the vertical longitudinal axis, wherein the aqueous medium is introduced at one or more locations.
2. A process according to claim 1, wherein the aqueous medium is introduced into the reactor at three or more different locations along the vertical longitudinal axis.
3. A process according to claim 1 or 2, wherein the reactor is a flow tube, a TVA reactor, a multichamber reactor operated co- or countercurrently, or a reactive or nonreactive distillation apparatus.
4. A process according to claim 3, wherein the reactor is a multichamber reactor or a flow tube which is fed with aminonitriles or dinitriles and diamines or mixtures thereof, if appropriate together with further polyamide-forming monomers and/or oligomers and a first portion of the aqueous medium at one end and with further portions of the aqueous medium being added in its continuation and from which a reaction mixture comprising a polyamide, its oligomers or mixtures thereof is discharged at its other end.
5. A process according to any one of claims 1 to 4 that comprises the following stages:

- 5 (1) reacting aminonitriles or dinitriles and diamines or mixtures thereof, if appropriate together with further polyamide-forming monomers and/or oligomers with the aqueous medium in the reactor at a temperature from 180 to 310°C and a pressure from 1 to 10×10^6 Pa to obtain a reaction mixture,
- 10 (2) further reacting the reaction mixture at a temperature from 200 to 300°C and a pressure which is lower than the stage 1 pressure, wherein the temperature and the pressure are chosen such that a first gas phase and a first liquid phase are obtained and the first gas phase is separated from the first liquid phase,
- 15 (3) admixing the first liquid phase with a gaseous or liquid phase comprising water or an aqueous medium at a temperature from 200 to 300°C and a pressure from 0.1 to 30×10^6 Pa to obtain a product mixture.
- 20 6. A process according to claim 5 that additionally or in lieu of stage 3 comprises the following stage:
- 25 (4) postcondensing the product mixture at a temperature from 200 to 280°C and a pressure which is lower than the stage 3 pressure, if stage 3 is carried out, wherein the temperature and the pressure are chosen such that a second gaseous phase, which comprises water and ammonia, and a second liquid phase, which comprises the polyamide, are obtained.
- 30 7. A process according to any one of claims 1 to 6 that utilizes metal oxide catalysts in the form of a fixed bed in the reactor or in stage 1 or in stage 3 or not only in the reactor or stage 1 but also in stage 3.
8. A process according to claim 3 or 4 that utilizes a reactor (1) having a vertically disposed longitudinal axis wherein, in the reactor (1), the reaction product is removed from the bottom and ammonia formed and any further

low molecular weight compounds formed and water are taken off overhead (2), wherein the reactor (1)

- comprises at least two chambers (4) arranged above one another in the longitudinal direction, wherein
 - the chambers (4) are separated from one another by liquid-tight bottom plates (5),
 - every chamber (4) is connected via a liquid overflow (6) to the immediately underlying chamber (4) and a liquid product stream is taken off via the liquid overflow (6) of the bottommost chamber (4),
 - the gas space (7) above the liquid surface in every chamber (4) is connected to the chamber (4) located immediately above it by one or more guide tubes (8) which opens, or which each open, into a gas distributor (9) having openings (11) for the exit of gas below the liquid surface,
 - and is also provided with at least one guide plate (12) which is arranged vertically around each gas distributor (9) and whose upper end is below the liquid surface and whose lower end is above the liquid-tight bottom plate (5) of the chamber (4) and which divides each chamber (4) into one or more spaces (13) into which gas flows and one or more spaces (14) into which gas does not flow.
9. A process according to any one of claims 1 to 8 wherein the aqueous medium has a solids content in the range from 2% to 30% by weight and at least 50% by weight of the solids are lactams and cyclic oligomeric lactams having two to six ring members that are derived from the aminonitrile used.
10. A process according to any one of claims 1 to 9 wherein aqueous medium only is introduced into the reactor at the at least two different locations.